The universe: inanimate space or a living organism?

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Abstract. The nature of the universe and the origin of life have always been the main questions of mankind. For many years, it has been asked whether life exists elsewhere in the universe, and if exists what is its structures and forms. However, more important question is that whether the universe itself is a living creature or just an inanimate space. To accept that we are living in an inanimate cosmos, it should be confirmed that the characteristics of living organisms are not appreciable for our universe. However, the problem is that exact definition of life is somewhat controversial in the scientific community. In terms of biology, there is a general agreement that the features growth, shape, system organization, and replication/reproduction are the minimum characteristics of a living system. Here, an overview of the characteristics of a living organism is given and then they will be compared to the universe features.

Key Words: cosmos, life, organism, system, universe.

Introduction. The nature of the universe and the origin of life have always been the main questions of mankind. The current standard model of cosmology, Big Bang scenario, can explain some features of our universe such as the distribution of galaxies but provides no comprehensive explanation for the creation of life and the long-term future (Steinhardt & Turok 2002a, 2002b).

The conditions of our universe have been fine-tuned for the creation of life. A number of hypotheses have been presented about the reason for the development of such conditions, for example, the God hypothesis and the multiverse hypothesis (Chan 2015). For many years, it has been asked whether life exists elsewhere in the universe, and if exists what is its structures and forms. However, more important question is that whether the universe itself is a living creature or just an inanimate space. Here, the possibility that our universe might be alive was discussed. In the beginning, an overview of the characteristics of a living organism is given and then the characteristics will be compared to the universe features.

The universe and characteristics of a living organism. To accept that we are living in an inanimate cosmos, it should be confirmed that the characteristics of living organisms are not appreciable for our universe. However, the problem is that exact definition of life is controversial in the scientific community (e.g., between philosophers, biologists, and cosmologists). In terms of physics, life can be a combination of thermodynamic disequilibrium + low-entropy state + information encoding and transformation (Schulze-Makuch & Irwin 2004; Deamer 2006; Tsokolov 2009). In biology, however, there is a general agreement that a living matter is a localized molecular assemblage with the following basic characteristics: system organization, autonomy, information processing, adaptability, shape, growth, and reproduction (Rosslenbroich 2016). The terms autonomy, information, and adaptability are vague and in the discourse of epistemology could be a matter of different interpretations (see the review article by Tsokolov 2009). Here, the features shape, system organization, growth,

and replication/reproduction which are the observational properties of life are described. Table 1 compares basic properties of life between a living organism and our universe.

Table 1

Comparison of basic properties of life between a living organism and the universe

Parameters	*Status of living organisms*	*Status of the universe*
System organization	The components of an organism are integrated into interdependent subsystems which carry out partial functions	There is no definitive reason to confirm or decline the hypothesis that different components of our cosmos are randomly distributed in the space and no relationship exists between them
Shape	Comprise a certain shape/form	Not yet discovered, a bubble shape has been suggested for the universe
Growth	Became larger in favorable environmental conditions	According to the Big Bang scenario, the universe is expanding since its origin
Reproduction	Capable of self-renewal/reproduction	Based on the scenario of wormholes, generation of a new cosmos from our universe is not impossible

Shape. Living systems exist in space and have overall form and shape. Generally, the exterior appearance of a living organism has a close relationship with its function (Rosslenbroich 2016). There are numerous species of living organisms with numerous shapes on Earth. Interestingly, some single-cell organisms such as ameba can alter their shape. Even, the shape of some creatures can change over time, through metamorphosis (e.g., frogs and caterpillars).

Universe and shape. What are the shape and the size of the universe is still an open question. Even, it is not clear that we reside in a finite or infinite space. It took thousands of years for humans to understand the earth is spherical. It may take centuries to achieve an understanding of the universe shape. In all forms of life we know, living organisms have finite volume. If we accept that no living creature can have infinite volume, the answer to the question whether our universe is finite or infinite can be the key to understanding whether our universe is alive or inanimate. However, finding the answer is very difficult for humans. The reason is that humans, like other living creatures, have limited types of sensory receptors and each has a limited ability. Therefore, new technology should be achieved over time to cover our sensory deficiency. This issue has been discussed with the example in Figure 1. Consider a bacterium (Number 1) that lives in the body of fish (like bacteria exist in the human gastrointestinal tract). Even assuming that the bacterium is able to understand it lives inside another living organism, it cannot be aware of the presence or absence of organism number 2. Similarly, organism number 2 is confined within the aquatic ecosystem and is not aware of the presence of a tree (number 3) away from the water. The tree itself is trapped in Earth's atmosphere and most likely is not conscious about the existence of life on other planets (number 4). Likewise, it is not impossible that the universe itself be a living system (number 5). In addition, Figure 1 also supports the idea that if life exists elsewhere in our universe, it can have forms different from anything we could imagine. For example, it is difficult for organism number 2 to image life can be sustained in water-free space (atmosphere air) like what is seen about organism number 3.

Among the current possibilities, results from the Wilkinson Microwave Anisotropy Probe mission suggested a finite universe. Even a bubble shape has been proposed by some cosmologists. However, ongoing works are required to allow us to address the issue related to the shape of the universe.

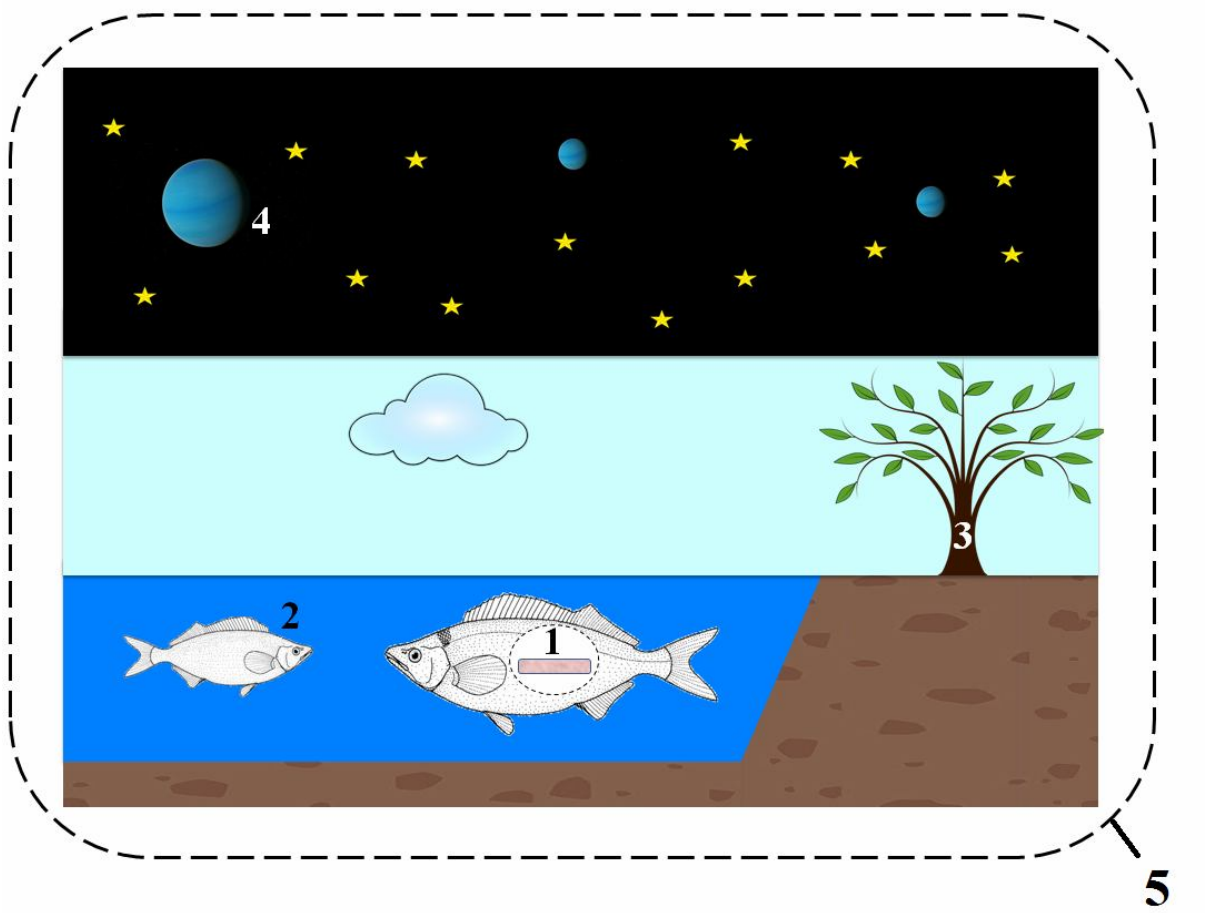

Figure 1. The hierarchy of life in the universe. Organism 1 (a bacterium that lives in the body of fish) most likely is not aware of the presence or absence of organism 2. Similarly, organism 2 is confined within the aquatic environment and is not aware of the presence of organism 3. The tree itself is trapped in Earth's atmosphere and most likely is not conscious of the existence of life on other planets (number 4). It is not impossible that the universe itself be a living system (number 5).

System organization. The body of a living organism is organized as an open concrete system. While inanimate substances such as soil are just randomly accumulated molecules in a region, living systems are non-randomly organized into co-acting inter-related components (Miller 1976). In the cell, as an instance of such a system, the components are integrated into interdependent subsystems which carry out partial functions. It should be considered that the structure of the whole system determines the function of its subsystem. This is the opposite of a nonliving system like a machine, in which the function of the components governs the outcome (Rosslenbroich 2016).

The universe as a system. To consider the universe as a non-living system, it should be confirmed that different components of our cosmos (stars, planets, galaxies, dark matter, etc.) are randomly distributed in the space and there is no relation between them. Now a big question arises: what is the outcome/output of each of the components of the universe (if any)? For example, does the Milky Way have any output that could impact on the output of another nearby galaxy? At present, there is no reason to confirm or decline the hypothesis that there is a functional relationship between different components of our cosmos.

Growth. To sustain survival and growth, a living system must maintain its inside parameters (pH, temperature, oxygen, salinity, etc.) in a physiologic range despite any alterations in environmental conditions. Growth is typically a non-linear process and in simple organisms (such as microbes) has lag, exponential, stationary and death phases

(Yates & Smotzer 2007). However, it should be noted that some cases that we consider them to be alive, for example, fertilized eggs of birds, undergo complex developmental process but their size will not increase. Therefore, over a period of time, an organism can be alive while not growing, evolving, or even acquiring nutrition from the surroundings (Tsokolov 2009).

Universe and expansion. According to the generally accepted Big Bang scenario, the Universe has expanded in size and evolved greatly since its origin. Our universe is still very young and has only approximately 14 billion years old. It is estimated that its expansion last at least several trillion years into the future (Steinhardt & Turok 2002a; Bahcall 2015). The question is whether the universe will experience death as a living organism. The accurate answer to this query is not yet clear.

Replication / reproduction. While accumulation of the known inanimate substances cannot replicate themselves autonomously, self-replication is one of the most important properties of a living organism. Replication requires transforming energy and molecules from the surroundings into cellular aggregations (Rasmussen et al 2004). In favorable conditions, single-cell organisms can be immortal, so that two new organisms are created by division and each one might continue replication without limitations (Rosslenbroich 2016). From the current perspective of biology, reproduction is tied to genome, as a bioinformation storage system. Yet, there are some instances that a system containing genetic information (e.g. virus) is not able to replicate itself without the help of other living systems. On the other hand, there are instances that a matter without genetic code (e.g. prions) is able to replicate itself after entrance into living organisms (Weissmann 2004). In this sense, a protein stands against other well-known infectious agents such as bacteria, fungi, and viruses which comprise genome. Furthermore, like growth, a case can have other features of life while not contain a genome and not able to replicate itself (e.g. red blood cell).

Universe and self-replication. Theoretically, generation of a new cosmos from our universe is not impossible. According to the scenario of wormholes and idea proposed by Stephen Hawking, our universe might be a bud pinched off from earlier cosmos with different laws of physics. Therefore, new universes might be sprouting from our universe and then grow and create their own self-contained branches of space-time.

Conclusions. Despite remarkable progress in biology, still, there isn't a generally accepted definition for a living organism. Technological advances in past centuries have changed our interpretation of the life. For example, before the invention of the microscope, scientists did not have a thorough understanding of single-cell organisms. It is therefore not impossible that in the future the current concept of life may be changed. This change may be in favor of the hypothesis of the universe is alive, or against it. Perhaps in the future centuries, scientists will wonder who we could be so delirious to believe the universe is alive, or how we could have been so unconscious as not to sense the viability of our cosmos. However, what we can say now is that there is no firm evidence to think the universe is just an inanimate space. It may seem that a superficial comparison has been made between the universe and characteristics of living organisms in this article. However, many of today's scientific advancements have been constructed based on the hypotheses of the former scientists. Even if it is proved that a given idea is wrong, the analyses which used to disprove that idea can provide available data which result in true theory.

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